

WHAT IS CLAIMED IS:

1. A printed circuit board constituted by alternately laminating interlayer resin insulating layers and conductive circuits on a core substrate containing a capacitor, an IC chip is mounted on an outer layer thereof, characterized in that

the core substrate containing said capacitor is constituted by providing a first resin substrate, a second resin substrate having an opening for containing the capacitor and a third resin substrate in a multilayer manner while interposing bonding plates, and the capacitor is located immediately below the IC chip.

2. A printed circuit board according to claim 1, wherein each of said bonding plates has a core impregnated with a thermosetting resin.

3. A printed circuit board according to claim 1, wherein each of said first, second and third resin substrates has a core impregnated with a resin.

4. A printed circuit board according to claim 1, wherein a plurality of capacitors are provided.

5. A printed circuit board according to claim 1, wherein the conductor circuits are formed on said second resin substrate.

6. A printed circuit board according to claim 1, wherein the capacitor is mounted on a surface of said printed circuit board.

7. A printed circuit board according to claim 6, wherein a capacitance of the capacitor on said surface is equal to or higher than a capacitance of a chip capacitor on an inner layer.
8. A printed circuit board according to claim 6, wherein an inductance of the capacitor on said surface is equal to or higher than an inductance of the chip capacitor on an inner layer.
9. A printed circuit board according to claim 1, wherein a metal film formed on an electrode of said capacitor.
10. A printed circuit board according to claim 9, wherein the metal film formed on the electrode of said capacitor is a plated film mainly consisting of copper.
11. A printed circuit board according to claim 1, wherein at least a part of a coating layer of the electrode of said capacitor is exposed and electrically connected to the electrode exposed from said coating layer.
12. A printed circuit board according to claims 1, wherein a chip capacitor having electrodes formed inside of an outer edge is employed as said capacitor.
13. A printed circuit board according to claim 1, wherein a chip capacitor having electrodes formed in a matrix is employed as said capacitor.

14. A printed circuit board according to claim 1, wherein a plurality of chip capacitors for providing many capacitors are coupled to be employed as said capacitor.

15. A printed circuit board constituted by alternatively laminating interlayer resin insulating layers and conductive circuits on a core substrate containing a capacitor, characterized in that

the core substrate containing said capacitor is constituted by providing a first resin substrate, a second resin substrate having an opening for containing the capacitor and a third resin substrate in a multilayer manner while interposing bonding plates, wherein

said first resin substrate and said capacitor are coupled to each other by an insulating bonding agent and the insulating bonding agent is lower in a coefficient of thermal expansion than said first resin substrate.

16. A printed circuit board manufacturing method:

(a) forming a conductor pad section on a first resin substrate;

(b) connecting a capacitor to said conductor pad section of said first resin substrate through a conductive bonding agent;

(c) providing a third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner while interposing bonding plates so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by the third resin substrate; and

(d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate.

17. A printed circuit board constituted by providing resin insulating layers and conductor circuits on a core substrate in a multilayer manner, wherein

said core substrate is constituted by bonding together a plurality of resin substrates, the conductor circuits formed on said plurality of resin substrates; and

a capacitor is contained in said core substrate.

18. A printed circuit board constituted by providing resin insulating layers and conductor circuit on a core substrate in a multilayer manner, wherein

said core substrate is constituted by bonding together a plurality of resin substrates, the conductor circuits formed on said plurality of resin substrates; and

a capacitor is contained in a concave portion formed in said core substrate.

19. A printed circuit board according to claim 17, wherein

said plurality of resin substrates are bonded together by interposing bonding plates.

20. A printed circuit board according to claim 19, wherein

each of said bonding plate has a core impregnated with a thermosetting resin.

21. A printed circuit board according to claim 17, wherein

each of said resin substrates has a core impregnated with a resin.

22. A printed circuit board according to claim 17, wherein a plurality of said capacitors are provided.
23. A printed circuit board according to claim 17, wherein the capacitor is mounted on a surface of said printed circuit board.
24. A printed circuit board according to claim 23, wherein a capacitance of a chip capacitor on said surface is equal to or higher than a capacitance of a chip capacitor on an inner layer.
25. A printed circuit board according to claim 23, wherein an inductance of a chip capacitor on said surface is equal to or higher than an inductance of the chip capacitor on an inner layer.
26. A printed circuit board according to claim 17, wherein a metal film is formed on an electrode of said capacitor and is electrically connected to the electrode on which said metal film is formed, by plating.
27. A printed circuit board according to claim 26, wherein the metal film formed on the electrode of said capacitor is a plated film mainly consisting of copper.
28. A printed circuit board according to claim 17, wherein at least a part of a coating layer of the electrode of said capacitor is exposed and electrically connected to the electrode exposed from said coating layer.
29. A printed circuit board according to claim 17, wherein a chip capacitor having electrodes formed inside of an outer edge is employed as said capacitor.

30. A printed circuit board according to claim 17, wherein a chip capacitor having electrodes formed in a matrix is employed as said capacitor.

31. A printed circuit board according to claim 17, wherein a plurality of chip capacitors for providing many capacitors are coupled to be employed as said capacitor.

32. A printed circuit board according to claim 17, wherein the capacitor is coupled to said core substrate by an insulating bonding agent and the insulating bonding agent is lower in a coefficient of thermal expansion than said core substrate.

33. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (e):

- (a) forming conductor circuits on a plurality of resin substrates;

- (b) providing a plurality of said resin substrates in a multilayer manner through bonding plates;

- (c) bonding together said resin substrates through said bonding plates, to thereby provide a core substrate;

- (d) forming a concave portion in said core substrate;

and

- (e) containing a capacitor in said concave portion.

34. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (e):

- (a) forming a resin substrate with a through hole and having a conductor circuit provided on a surface;

(b) forming a resin substrate without a through hole and having a conductor circuit provided on a surface;

(c) providing said resin substrate with the through hole and said resin substrate without the through hole through a bonding plate in a multilayer manner;

(d) bonding together said resin substrates through said bonding plate, to thereby provide a core substrate; and

(e) containing a capacitor in said concave portion.

35. A printed circuit board constituted by alternately providing interlayer resin insulating layers and conductor circuits in a multilayer manner on a core substrate containing a capacitor, wherein

the core substrate containing said capacitor is constituted by providing a first resin substrate, a second resin substrate having an opening for containing the capacitor and a third resin substrate in a multilayer manner while interposing bonding plates; and

via holes connected to a terminal of said capacitor are provided on both sides of said core substrate.

36. A printed circuit board according to claim 35, wherein

each of said bonding plates has a core impregnated with a thermosetting resin.

37. A printed circuit board according to claim 35, wherein

each of said first, second and third resin substrates has a core impregnated with a resin.

38. A printed circuit board according to claim 35, wherein

a plurality of said capacitors are provided.

39. A printed circuit board according to claim 35, wherein the conductor circuits are formed on said second resin substrate.
40. A printed circuit board according to claim 35, wherein the capacitor is mounted on a surface of said printed circuit board.
41. A printed circuit board according to claim 40, wherein a capacitance of a chip capacitor on said surface is equal to or higher than a capacitance of a chip capacitor on an inner layer.
42. A printed circuit board according to claim 40, wherein an inductance of a chip capacitor on said surface is equal to or higher than an inductance of the chip capacitor on an inner layer.
43. A printed circuit board according to claim 35, wherein a metal film is formed on an electrode of said capacitor and is electrically connected to the electrode on which said metal film is formed, by plating.
44. A printed circuit board according to claim 43, wherein the metal film formed on the electrode of said capacitor is a plated film mainly consisting of copper.
45. A printed circuit board according to claim 35, wherein at least a part of a coating layer of the electrode of said capacitor is exposed and electrically connected to the electrode exposed from said coating layer.

46. A printed circuit board according to claim 35, wherein a chip capacitor having electrodes formed inside of an outer edge is employed as said capacitor.
47. A printed circuit board according to claim 35, wherein a chip capacitor having electrodes formed in a matrix is employed as said capacitor.
48. A printed circuit board according to claim 35, wherein a plurality of chip capacitors for providing many capacitors are coupled to be employed as said capacitor.
49. A printed circuit board according to claim 35, wherein said first resin substrate and said capacitor are coupled to each other by an insulating bonding agent and the insulating bonding agent is lower in a coefficient of thermal expansion than said first resin substrate.
50. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (d):
- (a) attaching a capacitor to a first resin substrate through a bonding material;
 - (b) providing a third resin substrate, a second resin substrate having an opening for containing said capacitor and a first resin substrate in a multilayer manner so that said capacitor of said first resin substrate is contained in said opening of said second substrate and that said opening of said second resin substrate is closed by said third resin substrate, thereby providing a core substrate;

(c) applying laser and forming a via hole opening reaching said capacitor in said core substrate;

(d) forming a via hole in said via hole opening.

51. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (f):

(a) forming a via hole formation opening in a metal film on one side of a first resin substrate;

(b) attaching a capacitor to a metal film unformed surface of said first resin substrate through a bonding material;

(c) providing a third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by interposing bonding plates so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;

(d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate;

(e) applying laser to said via hole formation opening formed in said metal film of said first resin substrate, and forming a via hole opening reaching said capacitor; and

(f) forming a via hole in said via hole opening.

52. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (f):

(a) forming via hole formation openings in metal films of a first resin substrate and a third resin substrate, the metal films bonded on one sides of said first resin substrate and said third resin substrate, respectively;

(b) attaching a capacitor to a metal film unformed surface of said first resin substrate through a bonding material;

(c) providing said third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by providing a bonding plate on said metal film unformed surface so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;

(d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate;

(e) applying laser to said via hole formation openings formed in said first resin substrate and said third resin substrate, and forming a via hole opening reaching said capacitor; and

(f) forming a via hole in said via hole opening.

53. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (g):

(a) forming a through hole formation openings in metal films of a first resin substrate and a third resin substrate, the metal films bonded on one sides of said first resin substrate and said third resin substrate, respectively;

(b) attaching a capacitor to a metal film unformed surface of said first resin substrate through a bonding material;

(c) providing said third resin substrate, a second resin substrate having an opening for containing said capacitor and said first resin substrate in a multilayer manner by providing a bonding plate on said metal film unformed surface so that said capacitor of said first resin substrate is contained in said opening of said second resin substrate and that said opening of said second resin substrate is closed by said third resin substrate;

(d) heating and pressurizing said first resin substrate, said second resin substrate and said third resin substrate, to thereby provide a core substrate;

(e) applying laser to said through hole formation openings formed in said first resin substrate and said third resin substrate, and forming a via hole opening reaching said capacitor;

(f) removing or thinning said metal films; and

(g) forming a conductor circuit and a via hole on said core substrate.

54. A printed circuit board constituted by providing resin insulating layers and conductor circuits on a core substrate in a multilayer manner, wherein

a capacitor is included in said core substrate, and a relatively large lower-layer via hole connected to an electrode of said capacitor is formed; and

a plurality of relatively small upper-layer via holes connected to one said lower-layer via hole are provided in an interlayer resin insulating layer on an upper surface of said core substrate.

55. A printed circuit board according to claim 54, wherein

said lower-layer via hole is a filled via hole filled with an plated material and having a flat surface.

56. A printed circuit board according to claim 54, wherein said lower-layer via hole is a filled via hole having a resin filled inside and a metal film formed on a surface.

57. A printed circuit board according to claim 54, wherein said capacitor is singularly contained in a concave portion formed in said core substrate.

58. A printed circuit board according to claim 54, wherein a plurality of said capacitors are contained in a concave portion formed in said core substrate.

59. A printed circuit board according to claim 54, wherein a metal film is formed on an electrode of said capacitor and electrically connected to the electrode on which said metal film is formed, by plating.

60. A printed circuit board according to claim 59, wherein the metal film formed on the electrode of said chip capacitor is a plated film mainly consisting of copper.

61. A printed circuit board according to claim 54, wherein at least a part of a coating layer of the electrode of said capacitor is exposed and electrically connected to the electrode exposed from said coating layer.

62. A printed circuit board according to claim 54, wherein a chip capacitor having electrodes formed inside of an outer edge is employed as said capacitor.

63. A printed circuit board according to claim 54, wherein a chip capacitor having electrodes formed in a matrix is employed as said capacitor.

64. A printed circuit board according to claim 54, wherein a plurality of chip capacitors for providing many capacitors are coupled to be employed as said capacitor.

65. A printed circuit board according to claim 54, wherein a resin lower in a coefficient of thermal expansion, than the core substrate, is filled between said core substrate and the capacitor.

66. A printed circuit board manufacturing method characterized by comprising at least the following steps (a) to (e):

- (a) embedding a capacitor in a core substrate;
- (b) forming a resin insulating layer on an upper surface of said capacitor;
- (c) forming a relatively large lower-layer via hole connected to an electrode of said capacitor, in said resin insulating layer;
- (d) forming an interlayer resin insulating layer on an upper surface of said core substrate; and
- (e) providing a plurality of relatively small upper-layer via holes connected to one said lower-layer via hole, in said interlayer resin insulating layer.

67. A printed circuit board manufacturing method according to claim 66, further comprising, before step (a), a step of forming a concave portion in said core substrate and containing said capacitor in said concave portion.

68. A printed circuit board manufacturing method according to claim 66, further comprising, before step (a), a step of forming a concave portion in said core substrate and containing a plurality of said capacitors in said concave portion.

69. A printed circuit board manufacturing method according to claim 66, further comprising, before step (a), a step of forming a through hole in a resin plate, and bonding a resin plate to said resin plate on which said through hole is formed, to thereby form a core substrate having a concave portion.

70. A printed circuit board manufacturing method according to claim 66, wherein a filled via hole filled with a plated material and having a flat surface is formed when forming said lower-layer via hole.

71. A printed circuit board manufacturing method according to claim 66, wherein a filled via hole formed by filling a resin inside and then providing a metal film on a surface, is formed when forming said lower-layer via hole.

72. A printed circuit board manufacturing method according to claim 68, further comprising, after step (a), a step of applying a pressure to upper surfaces of said plurality of capacitors within said concave portion from above, and making heights of the upper surfaces of said capacitors uniform.